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EXAMINER	
WU, ALLEN S	

ART UNIT	PAPER NUMBER
2135	5

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Please find below and/or attached an Office communication concerning this application or proceeding.

PRL

Office Action Summary	Application No.	Applicant(s)
	09/532,025	HINTON ET AL.
	Examiner	**Art Unit**
	Allen S. Wu	2135

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *15 August 2001*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-22* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-22* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *17 July 1998* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date *2,3,4*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 112

1. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

2. Claim 20 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim 20 recites the limitation "said at least two receiving chaotic oscillators" in line 2 of claim. There is insufficient antecedent basis for this limitation in the claim. For the purposes of this office action, "said at least two" refers to the at least two oscillating regimes stated in line 10 and 10 of claim 19.

Priority

3. An application in which the benefits of an earlier application are desired must contain a specific reference to the prior application(s) in the first sentence of the specification of in an application data sheet (37 CFR 1.78(a)(2) and (a)(5)). The specific reference to any prior nonprovisional application must include the relationship (i.e., continuation, divisional, or continuation-in-part) between the applications except when the reference is to a prior application of a CPA assigned the same application number.

Claim Rejections - 35 USC § 103

4. Claims 1-6 are rejected under 35 U.S.C. 103(a) as being unpatentable over Corron et al, US Patent 5,857,165, in view of Cuomo et al, US Patent 5,291,555.

As per claim 1, Corron et al discloses a communications device (abstract, col 3 ln 37-47), comprising: a transmitting chaotic circuit with at least one circuit element (fig 2) the value of which affects a chaotic electrical property of said chaotic circuit (input voltages, fig 2); said at least one circuit element having multiple component elements (capacitors c1 and c2, fig 2), said chaotic property being applicable to a communications channel such that said chaotic property is detectable by a receiver signally connected to said communications channel (fig , col 3 ln 38-65), whereby said property forms a chaotic carrier signal (col 3 ln 38-65), whereby said chaotic carrier signal is modulated by said information signal (abstract, col 3 ln 38-44).

Corron et al further discloses modulation switching between two chaotic states through input modulation values V_R and V_L into R_1 and R_2 (col 7 ln 14-27), wherein the modulation sates are defined by equation (29). The sates may either be discrete of continuous (see figure 4 plot 208). Switching in the case of the discrete two-value case is occurring between the two states to the chaotic system. However, Corron et al does not explicitly teach a component element being isolated from said chaotic circuit by a switch such that when said switch is switched to a first state, said value has a first magnitude and when said switch is switched to a second state, said value has a second magnitude. Cuomo et al

discloses such a switch for modulation of a signal (col 4 ln 8-43), wherein said switch being controllable responsively to an information signal (V_{in}, col 4 ln 35-43). Both Cuomo et al and Corron et al disclose a communication device using properties of a chaotic system, including modulating of a chaotic signal. It would have been obvious to one of ordinary skill in the art at the time of the time the invention was made to combine the teachings of Cuomo et al and Corron et al to further vary the circuit element of a chaotic circuit as another means of modulating a chaotic signal

As per claim 2, Corron et al discloses wherein said at least one circuit element is a capacitance (fig 2).

As per claim 3, Corron et al discloses a field effect transistor (FET) for modulation (fig 2, see also tables 2 and 3). Furthermore, Cuomo et al discloses the switch (as described in claim 1) comprising of a field effect transistor (330, fig 3).

As per claim 4, the combination of Corron et al and Cuomo et al does not explicitly teach wherein said FET is an optoisolator. However, optoisolators are well known in the art to comprise of JFET coupled to an LED such that the JFET resistance goes down to 100 ohms and when the LED is off the resistance is unmeasurably high. Thus one of ordinary skill in the art would have recognized

the advantage of using an optoisolator as an excellent series/shunt switch, which are also relatively cheap.

As per claim 5, Corron et al further discloses a controller programmed to decompose an information signal into successive actuations of said switch to encode said information signal by modulating said chaotic carrier (information signal is modulation on a carrier through parameter modulation of an oscillator, col 2 ln 20-37 and col 3 ln 38-48).

As per claim 6, Corron et al further discloses said transmitting chaotic circuit includes a Chua circuit (fig 2, col 6 ln 23-28).

5. Claims 7-21 are rejected under 35 U.S.C. 103(a) as being unpatentable over Corron et al, US Patent 5,857,165.

As per claim 7, Corron et al discloses a communications device (abstract, col 3 ln 37-47), comprising: a transmitting chaotic circuit configurable responsively to an information signal (col 3 ln 38-46) such that said transmitting chaotic circuit produces at least three different chaotic signals (lambda specifying a different state of the system. Corron further discloses both discrete and continuous variation of lambda, and hence at least three chaotic signals, fig 4 plot 208 and equation 23), each being characterized by a different trajectory versus-time characteristic (time varying lambda, col 3 ln 58-col 4 ln 23, equation

3, and col 7 ln 12-29), a receiver with an oscillating sub portion to which said at least three different chaotic signals can be applied to drive said oscillating sub portion (figs 3 and 4, col 2 ln 20-21).

Corron et al does not explicitly teach a beat detector connected to said oscillating sub portion to determine a difference between a fundamental frequency of said oscillating sub portion and a current one of said at least three different chaotic signals, whereby said information signal is detected by said beat detector. However, Corron et al discloses demodulation of one or more states (fig 4) using a filter (col 4 ln 56-60). Corron et al does this so as to make his system capable of utilizing both analog as well as digital signals. The office takes official notice that if only digital signals are utilizes; the preferred method of demodulation is the use of a beat detector (BFO). It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the teachings of Corron et al to make use of a BFO in the detection stage because of its simplicity of construction, effectiveness to detect a code of digital signal, and is cost effective.

As per claim 8, Corron et al does not explicitly teach a fast Fourier Transform (FFT) calculator. However, FFT is a standard means of using convolution to separate two signals (the carrier from the modulation), especially when modulating a digital signal. It would have been obvious to one of ordinary skill in the art at the time the invention was made to further modify the beat

detector (as described in claim 7) to include a FFT calculator within the system of Corron et al because it would have performed signal enhancement in addition to demodulating a signal.

As per claim 9, Corron et al further discloses said oscillating sub portion includes a tank circuit (LC combination of fig 2).

As per claim 10, Corron et al further discloses, said transmitting chaotic circuit is configurable by selectively isolating and connecting circuit elements thereof to vary at least one of a capacitance, an inductance, and a resistance (fig 2, col 3 ln 38-65).

As per claim 11, Corron et al further discloses said chaotic circuit being a configurable Chua circuit (col 6 ln 24-27).

As per claim 12, Corron et al each of said at least three different chaotic signals corresponds to a separate configuration of said chaotic circuit (lambda specifying a different state of the system. Corron further discloses both discrete and continuous variation of lambda, and hence at least three chaotic signals, fig 4 plot 208 and equation 23); said Chua circuit includes a tank circuit with a capacitor with a capacitance C_2 and an inductor with inductance L, coupled to a non-linear resistance element through a resistor with resistance R (L_1, C_2, R_5, fig

2); the values of said inductance, said capacitance, and said resistance, of all of said separate configurations are characterized by equal values of alpha=C_1/C_2 and beta=R^2C_2/L (equations 27, col 6 ln 65-col 7 ln1).

As per claim 13, Corron et al disclose a communications receiver (fig 1, col 3 ln 38-45) and a chaotic oscillator having an oscillator portion (LC circuit, fig 2) and a chaotic portion with a non-linear resistance element (noisy diode circuit, fig 2 and fig 3); said oscillator portion and said chaotic portion being coupled to pass a current signal there between (R_5, fig 2, see also fig 3); said oscillator portion being signally coupled to a communications medium carrying a modulated chaotic signal (fig 1, col 3 ln 38-45) ; and said chaotic portion being signally coupled directly to said communications medium such that a voltage of said communications medium is directly applied to said chaotic portion through a circuit path parallel to a coupling allowing said current signal to pass between said oscillator portion and said chaotic portion (see V_{c1} and V_{c2} of fig 2 and V_{c1} of fig 3). Corron et al further discloses that when said oscillator and chaotic portions are coupled, they form a chaotic oscillator (fig 2). However, Corron et al does not explicitly disclose a receiver comprising of such a chaotic oscillator. However, Corron et al discloses a method of demodulation at the receiver through similar circuitry tuning the receiver characteristics to those of the transmitter. Applicant's admitted prior art discloses a chaotic oscillator at both the transmitter and receiver (fig 1B and page 3 paragraph 2). It would have been

obvious to one of ordinary skill in the art at the time the invention was made to combine the teachings of applicant's admitted prior art within the system of Corron et al as an alternative method of demodulating a signal through synchronization between the transmitter and receiver.

As per claim 14, Corron et al does not explicitly teach a comparator having a first input coupled to said communications channel and a second input coupled to said chaotic portion whereby an output of said comparator indicates, by nominal zero levels, a difference between a frequency characterizing said modulated chaotic signal and a frequency of said chaotic portion. However, Corron et al discloses an alternative method of demodulation through a modulation parameter that does not appear in the synchronous subsystem. One of ordinary skill in the art at the time the invention was made would have been able to modify the teachings of Corron et al to include such a comparator as an alternative method of demodulation, since the applicant has not explicitly stated such a comparator is for any particular reason other than synchronization for demodulation and that the method proposed by Corron et al is just as efficient.

Furthermore, Corron et al does not explicitly teach said chaotic portion being coupled to said communications medium through a resistor bridging said first and second inputs of said comparator. The office takes official notice that a resistance bridge across the carrier and communication channels is a standard method of demodulation. One of ordinary skill in the art at the time the invention

was made would have been motivated to modify Corron to use such a means, as it is superior for coded or digital communication as well as being simple and cheap to implement.

As per claim 15, Corron et al further discloses wherein said chaotic portion includes a capacitor coupled to said non-linear resistance element (fig 2).

As per claim 16, Corron et al further discloses wherein said oscillator portion includes a tank circuit (LC combination of fig 2).

As per claim 17, Corron et al does not explicitly teach a beat detector connected to said oscillating sub portion to determine a difference between a fundamental frequency of said oscillating sub portion and a current one of said at least three different chaotic signals, whereby said information signal is detected by said beat detector. However, Corron et al discloses demodulation of one or more states (fig 4) using a filter (col 4 ln 56-60). Corron et al does this so as to make his system capable of utilizing both analog as well as digital signals. The office takes official notice that if only digital signals are utilizes; the preferred method of demodulation is the use of a beat detector (BFO). It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the teachings of Corron et al to make use of a BFO in the detection stage

because of its simplicity of construction, effectiveness to detect a code of digital signal, and is cost effective.

As per claim 18, Corron et al does not disclose a counting circuit connected to said comparator output. The office takes official notice that a counting circuit is well known in the art to be used for handling error correction. It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the teachings of Corron et al to further include a counting circuit because it would have added effective error correction handling.

As per claim 19, Corron et al discloses a communications device (abstract, col 3 ln 37-47) comprising: a chaotic oscillator connectable to a communications channel (figure 2, col 3 ln 37-47) said chaotic oscillator having a tank circuit with at least two capacitors and an inductor (fig 2); a first of said at least two capacitors being connected to an inductor and a second of said at least two capacitors being connected to said inductor to combine respective capacitances of said at least two capacitors through a switch (elements L1 and C2 are connected in parallel to form a tank circuit and C1 is connected to the tank and the FET op amp, which is the switch, fig 2); said switch having an input for accepting an information signal, whereby said chaotic oscillator is selectively alternated between at least two oscillating regimes (inherent to the alternating states or trajectories of Chua oscillator) and thereby modulated in accord with

said information signal to generate chaotic signal which at each instant oscillates according to a selected one of said oscillating regimes (fig 1 and 2, col 6 ln 24-28 and col 10 ln 35-36); a receiver signally coupled to said communications channel (fig 1); and said receiver having a receiving chaotic oscillator portion for each of said at least two oscillating regimes (if the signal is discrete, states of the oscillators will have at least two states, see fig 4, plot 208), each portion being configured to synchronize with a respective one of said at least two chaotic signals (transmitter is in sync with the receiver, col 2 ln 22).

Corron et al does not explicitly teach a second of said at least two capacitors being selectively connectable to said inductor to combine respective capacitances of said at least two capacitors through a switch. However, Corron et al discloses an alternative means of modulating a signal with said information signal to generate chaotic signal which at each instant oscillates according to a selected one of said oscillating regimes (figs 1 and 2, and col 6 ln 24-28 and col 10 ln 35-36). It would have been obvious at the time the invention was made for an ordinary skill in the art to have a design choice to modify the teachings of Corron et al to selectively connect at least two capacitors to combine respective capacitances of said at least two capacitors through a switch because the applicant has not explicitly stated any reason of such connectability other than for modulating and synchronizing a signal and the means of modulation and synchronization as disclosed by Corron et al is just as efficient.

As per claim 20, Conner et al does note explicitly teach a detector connected to detect when said receiving Chua circuit is in synchrony with a chaotic signal generated by said transmitting Chua circuit. However, Conner et al discloses an alternative method of detecting when said receiving Chua circuit is in synchrony with a chaotic signal generated by said transmitting Chua circuit through a modulation parameter that does not appear in the synchronous subsystem (col 2 ln 20-36 and col 9 ln 53-61), which is effective for both analog and digital signals (col 2 ln 38-47). Furthermore, Conner et al discuses, in reference to prior art, a detector for detecting when said receiving circuit is in synchrony with a chaotic signal (col 1 ln 40-50) for digital signals. It would have been obvious at the time the invention was made for an ordinary skill in the art to have a design choice to modify the teachings of Conner et al to include such a detector for digital signals because the applicant has not stated any particular reason for such a detector, other than for the means of demodulation, and that the demodulation means disclosed by Conner et al is just as efficient.

As per claim 21, a communications system comprising: transmitting and receiving Chua circuits at least one component of said transmitting Chua circuit including at least two subcomponents, at least one of which being selectively isolated from said transmitting Chua circuit by a switch (isolates from the chua circuit via an op amp FET switch, fig 2) such that a current oscillating regime of said transmitting Chua circuit is selectively alternated between at least two

respective oscillating regimes (if the signal is discrete, states of the oscillators will have at least two states, see fig 4, plot 208); said switch being switchable responsively to an information signal (V_R and V_L, fig 2), values of said at least two subcomponents together with a configuration of said switch being such that one of said at least two oscillating regimes is substantially the same as an oscillating regime of said receiving Chua circuit, whereby said receiving Chua circuit is synchronizable with said transmitting Chua circuit (col 2 ln 20-22) when said current oscillating regime is said one of said at least two oscillating regimes (if the signal is discrete, states of the oscillators will have at least two states, see fig 4, plot 208); whereby said information signal may be recovered from said chaotic signal (figs 1 and 2, and col 2 ln 20-22).

Conner et al does note explicitly teach a detector connected to detect when said receiving Chua circuit is in synchrony with a chaotic signal generated by said transmitting Chua circuit. However, Conner et al discloses an alternative method of detecting when said receiving Chua circuit is in synchrony with a chaotic signal generated by said transmitting Chua circuit through a modulation parameter that does not appear in the synchronous subsystem (col 2 ln 20-36 and col 9 ln 53-61), which is effective for both analog and digital signals (col 2 ln 38-47). Furthermore, Conner et al discuses, in reference to prior art, a detector for detecting when said receiving circuit is in synchrony with a chaotic signal (col 1 ln 40-50) for digital signals. It would have been obvious at the time the invention was made for an ordinary skill in the art to have a design choice to

modify the teachings of Conner et al to include such a detector for digital signals because the applicant has not stated any particular reason for such a detector, other than for the means of demodulation, and that the demodulation means disclosed by Conner et al is just as efficient.

6. Claim 22 is rejected under 35 U.S.C. 103(a) as being unpatentable over Corron et al, US Patent 5,857,165, in view of Pecora et al, US Patent 5,379,346.

As per claim 22, Corron et al discloses chaotic communications system (abstract, col 3 ln 37-47), comprising: a transmitter (fig 1); a receiver (fig 2); said transmitter having first and second subsystems (drive subsystem, fig 2, col 3 ln 38-65), one of said first subsystem and said second subsystem being drivable by one of an external driving signal (col 4 ln 5-14), and a pre-established initial state (col 5 ln 28); said first and second subsystems being configured such that a chaotic oscillation is maintained there between whereby said first and second signals are chaotic (col 3 ln 38-65, fig 2); said transmitter further including a modulator responsive to an external information signal connected such that said chaotic oscillation is perturbed and a modulated signal derived thereby or a signal derived from said chaotic oscillation unperturbed is augmented such that said signal is modulated (modulation parameter, col 3 ln 38-46); said receiver having third and fourth subsystems (synchronous subsystem, col 2 ln 19-37, and fig 3).

Corron et al further discloses a first and second subsystem being implemented in hardware (fig 2). Corron et al does not explicitly teach said first and second subsystems being generated numerically by a compute. The means of simulating hardware with a computer is well known in the art (as noted by applicant, page 29 paragraph 4 of specification). It would have been obvious to one of ordinary skill in the art at the time the invention was made to simulate the subsystems of Corron et al's teachings with a computer because it would have eliminated circuitry design and the drawbacks of manufacturing tolerances of hardware implementations. That the first and second subsystems are lossless is inherent to a computer simulation of such subsystems.

Corron et al further discloses said receiver also having a synchronizing filter for applying a filtered version of said received second signal to said fourth subsystem (col 2 ln 33-37 and col 5 ln 56-60). Corron et al further discloses a means to derive a received information signal from said received second signal through the use of a demodulating filter, col 4 ln 56-65). Corron et al does not explicitly teach said receiver having a decoder connected to derive a received information signal from said received second signal by comparing said received second signal to a signal inhering in said receiver. Pecora et al discloses a communications device for encoding an information signal using chaotic systems (col 9 ln 49-60) including a transmitter having a first subsystem being connected to apply a first signal generated in said first subsystem to said second subsystem (col 2 ln 29-48 and col 9 ln 49-60); said second subsystem being connected to

apply a second signal generated in said second subsystem to said first subsystem (col 2 ln 29-48 and col 9 ln 49-60); a receiver with third subsystem being connected to apply a third signal generated in said third subsystem to said fourth subsystem (col 2 ln 29-48 and col 11 ln 46-65); said transmitted second signal being connectable through a communication channel connectable to said third subsystem (col 11ln 67-col 12 ln 8), whereby a received version of said second signal is applied to said third subsystem (col 10 ln 55-col 11 ln 11 and col 11 ln 67-col 12 ln 57), and a receiver which comprises of a decoder connected to derive a received information signal from said received second signal by comparing said received second signal to a signal inhering in said receiver (col 10 ln 55 – col 11 ln 11). Both Pecora et al and Corron et al disclose a method of communication using chaotic synchronized circuits. It would have been obvious to one of ordinary skill in the art at the time invention was made to combine the teachings of Pecora et al within the system of Corron et al as because it would have eliminated transmission of different drive and synchronized signals (see Pecora et al, col 2 ln 28-32).

Conclusion

7. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Yang et al, US Patent 6,331,974, discloses a communications system using chaotic synchronized circuits.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Allen S. Wu whose telephone number is 703-305-0708. The examiner can normally be reached on Monday-Friday 9am-5pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Kim Vu can be reached on 703-305-4393. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

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